21st century teachers for our 21st century students

The coordinators of this journal, to whom I must express my gratitude for such a trust, have handed over me the task of steering this new section devoted to education in biochemistry. The challenge is not trivial; I would be satisfied if I just achieve some contribution that will help you in your teaching activity. And the major question I confront is: what orientation should I give this section?

If we teach today's students as we taught yesterday's, we rob them of tomorrow.
John Dewey, *Democracy and Education*. New York: Macmillan Company, 1944, p. 167.

In these years of transition –for some already mature, for others still a weakly explored territory– to the new degrees and regulations derived from adoption of the European Higher Education Area, many may be expecting some guidelines for the *bolognization*.

The truth is, on the one hand, I am not the most qualified to indoctrinate anyone, or to offer *magical recipes* that likely do not exist and, on the other hand, in many cases this topic already hits a predetermined stance, either of affinity or of marked opposition. I believe, hence, that it is not appropriate to stand up for positions, to philosophise or to wield psicopedagogical arguments. I'd rather have this section be a forum to promote reflection, and particularly I would like to be practical, presenting some experiences, techniques, tools, approaches… that may inspire us all while planning our teaching practice.

I do dare to start with some brief mention of what I believe most significant in this change.

Aside from the formal and legal changes in the structure of degrees, most of us link the *Bologna process* with a change in the way to implement teaching. However, that was strictly not in the definition of the EHEA or, in any case, they are two aspects we should consider separately. It is indeed true that with this remodelling the need has been reinforced to direct teaching focus towards student-centred learning, to give in the design more prominence to the students and less to the instructor, to change the paradigm of a teacher as provider of information and knowledge towards the role of counsellor, facilitator –for biochemists, catalyst– of learning.

An indicator of this intent of change is the ECTS calculation system for courses and degrees, centred on the amount of working hours for the student (40 per week) and not on the number of lectures given. Another one is the equivalence of degrees across countries, not based on their contents –something that was to be expected and that some still insist on thinking on–, but on the extent of work involved. Remember the "T" in ECTS: mobility and equivalence do not come from comparing the syllabi, but from the credits.

Not long ago I had the chance to hear from Professor José Carreras this beautiful analogy: the shift from a "funnel teacher", who *channels* knowledge in order to *fill* the student, to an "enzyme teacher", who just *catalyses, accelerates* what the student could eventually achieve on his own.

For some, the layout of the reform has already aroused a rash –if you allow me the metaphor– and they stand up with belief for the idea that the change just trivialises the teaching process, reduces student responsibility –to whom every day *we are telling what to do*– and even leads to a decreasing learning of the subject. It is not uncommon to hear "more of them pass, but they know less" or "this is becoming a school". So will it now turn out that helping the students week after week, so that they study and learn, is not a task belonging to a professor? Maybe it is better to let the students *learn how to organise their time* (without anyone teaching them how to do that).

Anyhow, I promised not to philosophise and I am defaulting. So I will end this introduction by presenting three ideas:

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1.- The need to motivate the student, organise activities for practise, working in groups, preparation and presentation of *assignments* about a topic… did already exist time ago. Maybe some instructors used them less than others, and in general the time constraints and density of the programmes had led to some relaxation and to forget these principles. In my opinion, Bologna has brought us a reminder of something that was common sense and good practice.

2.- There are serious studies, made using the scientific method, and not just by pedagogues, that demonstrate the effectiveness of the change in paradigm on the students training. The change may be more or less comfortable to us, it may require or not much time that must *be robbed* from the research activity, anyhow, we may remodel our teaching to a greater or lesser extent, but we should not deny the validity with no other argument than our conviction or the inertia to change.

3.- For those who feel overwhelmed: you need not do the revolution, redefine 100% of your teaching methodology. Small changes can be included progressively, within the feasibility of real circumstances, and yet achieve some advantages for our students learning.

I will now put forward my ideal of what we could pretend with this section. I say an ideal, since it is still to be seen if I can achieve it, although I am fortunate enough that some have expressed their confidence on me to do it. Only because of this I can dare to accept this responsibility.

First, to raise awareness about the significance of moving into active learning. Second, to encourage, inspire, propose methods and tools; in short, help each one to find his own route to improvement.

Why do we need to make changes? Wasn't it good what we had?

Of course, this kind of questions discredit themselves, when one confronts them impartially. There is always room for improvement! But let's make some more reflections in this regard.

If none of us are doing research as it used to be done 100 years ago, why do we *deliver lectures* as it was done one century ago? The famous citation from John Dewey that heads this article talks about training students for whatever new they might encounter. Strikingly enough, it was written 70 years ago, if not before; there have always been, of course, illustrious minds, and humanity goes in circles.

It is not just an ideology; two tangible reasons may be posed. First, we are not in the same situation; reality of science and society has changed. Second, we have practical, methodological options we did not have before. And this is so in teaching and student training as well as in research.

Can we pretend the student to learn *all* biochemistry? How do we face the dramatic growth of the subject? Which parts are the most important, and which ones are dispensable? It is obvious we cannot address the training of our students with the traditional approach of *studying* the core information.

To that, we must add the change in availability and access to information; nowadays it is both abundant and very immediate. What we may find lacking –for which we must train the students– is the ability to manage that information, the judgement to filter it and the knowledge to analyse it.

«If none of us are doing research as it used to be done 100 years ago, why do we deliver lectures as it was done one century ago?»

Is it important to know the reactions in the "X" metabolic pathway? Of course it is! Then I ask you, professor: Do you know them, if several years have passed since you last taught that part of the course and it is not close to your research area? And, if that is not the case, do you consider that a fault in your abilities? Maybe you were trained well enough so you are able to (a) know how to search for it successfully and (b) quickly assimilate it, and even (c) explain it to others. Let's ponder on this when we think which abilities we should aim for in our students.

There is the temptation to link educational innovation to technological innovation. This, for some –including who is writing this– is a draw: it is exciting what can be done nowadays. But for others, less prone to technology, such an association may result in a rejection of the change in teaching strategy. On occasions it is easy to fall into an excessive focus on technology, due for instance to institutional

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incentives (innovation grants, publications, external funding, media impact) which may back it up for the mere technological innovation. This may be good but as well may drag us out of focus; we must avoid technology becoming an objective in itself and instead think about what it may offer for the training process.

I always defend that, as instructors, we have adopted tools as they have appeared, because they were useful. That is the key. I do not remember anyone objecting the use of the overhead projector, when it became available. However, there is currently who despises using PowerPoint or the virtual campus platforms. What would the reasons be? Maybe a lack of will to learn how to use it, or to use it efficiently, or just the mere reluctance to change. It is true that it takes time and some effort, but nobody rejects using on-line applications to apply for a grant or for official recognition of research activity; we don't process experimental data using pencil, paper and drawing pen, either. Nothing serious will happen whether or not you use a particular tool. What matters is how you catalyse your students. Let's call the controversy off. We should just read, listen to what others are doing, keep our mind open and think on what and how it may serve us to be better trainers of the future biochemists. I will finish with a borrowed phrase:

> *Welcome to 21st century education in biochemistry: we professors make THE difference!*

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